Application of mapping and selective biopsy of the sentinel lymph node in the most frequent canine tumors in veterinary medicine

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Introduction

The sentinel lymph node (SLN) is the first lymph node (LN) within a lymphatic drainage basin to which a primary tumor reliably drains. The mapping and selective biopsy consists on localize the SLN and remove it surgically for histopathological analysis. If the result is positive, it means that SLN has metastatic cells so radical lymphadenectomy (LAD) is needed. If the result is negative, it means that the rest of the lymphatic drainage is free of disease and therefore surgical excision of the LNs is not necessary performed. The **main aim** of this work is to make a review of different mapping techniques and to analyze its feasibility to be applied as a routine in LNs evaluation in canine oncological patients.

Situation in human medicine

SLN biopsy is well established as a standard step of staging in mammary gland tumors and melanoma. The procedure applied is:

Preoperative scintigraphy → Intraoperative mapping with hand-held gamma camera → Blue dye injection to improve the visualization of SLN

Importance of SLN identification

The regional LNs are not always the SLN because of the lymhangiogenesis related with tumors. This technique allows:

- Individually identification of the drainage pattern of each patient.
- An accurate staging of tumors that marks the therapeutic protocol → adjuvant therapies as radiotherapy and chemotherapy are administered in advanced stages.

Situation in veterinary medicine

The mapping and selective biopsy of SLN is not used as a staging routine in the most frequent canine tumors: melanoma, mastocytoma and mammary gland tumor.

Currently, the methods used to evaluate the status of LNs are palpation and fine needle aspiration cytology**.** The main **disadvantages** are:

PALPATION

- Low sensitivity and specificity → inflammation also increase LNs size.
- Micrometastases take long time to produce palpable lymphadenomegaly.
- Difficult anatomical localization of LNs.

CYTOLOGY

- Unrepresentative sample.
- Not all LNs are susceptible to be aspirated.
- It can't determine the degree of infiltration of tumor cells and the relation between them.

Alternative techniques for mapping SLN

	1	2		3	4
Technique	Lymphoscintigraphy or gammagraphy (Fig.1)	Indirect lymphography by X-ray (Fig.2a)	Indirect lymphography by CT (Fig.2b)	Contrast-enhanced ultrasound (Fig.3)	Fluorescein and patent blue dyes (Fig.4)
Contrast	99mTc-Labeled dextran	Lipiodol Ultrafluid TM	Lipiodol Ultrafluid TM	Octafluoropropane-filled lipid microspheres	Methylene blue and fluorescein

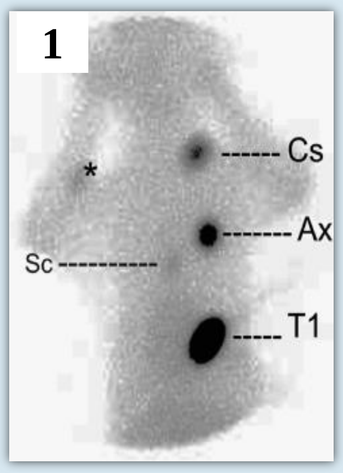

Figure 1. Ventral gammagraphy. The image shows the activity of axillary (Ax), cranial sternal (Sc), and superficial cervical (Cs) LN1s[1].

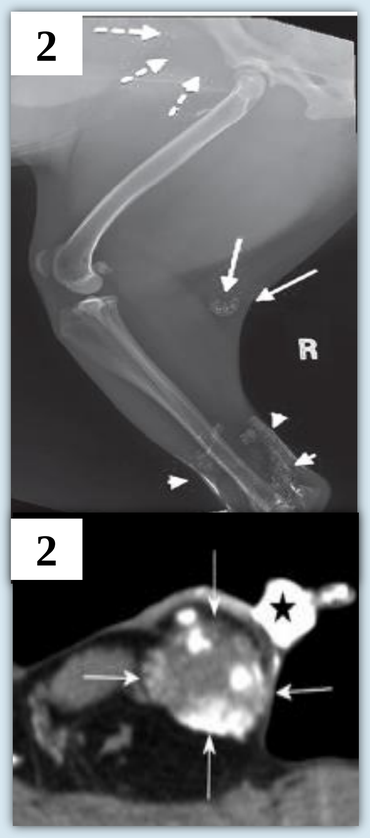

Figure 2a. Lateral X ray 24h after intradermal injection of the contrast. Long arrows indicate the contrast-enhanced popliteal LN[2].

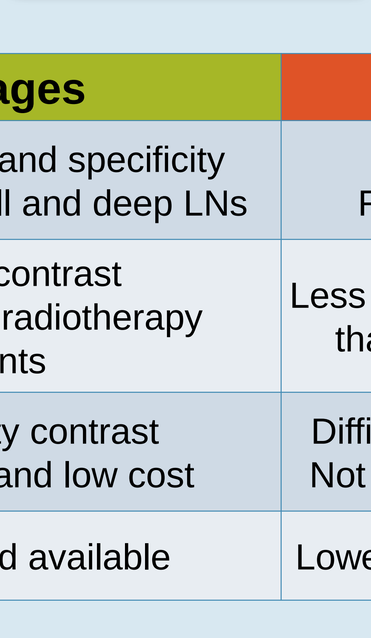

Figure 2b. Transverse CT-LG. The image shows the spotted appearance of an enlarged SLN (asterisk indicates the 5th mammary gland)[3].

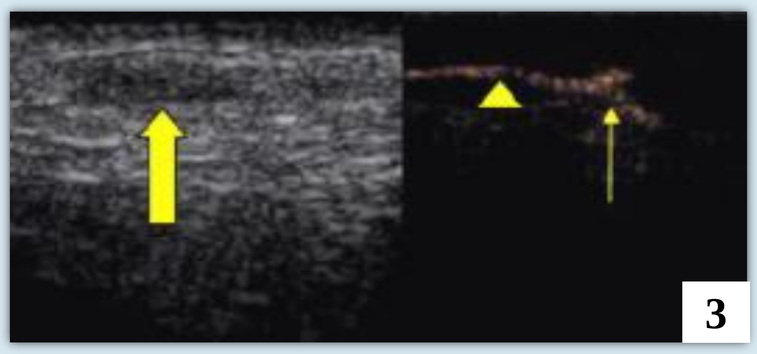

Figure 3. Screen capture of an ultrasound image. Left image: normal hypoechoic LN (arrow). Right image: the contrast is in a lymphatic channel (arrowhead) beginning to fill LN (thin arrow)[4].

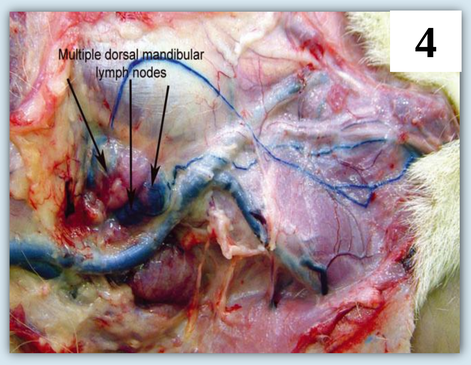

Figure 4. Methylene blue drainage from mouth and lip in malignant melanoma[5].

	Advantages	Disadvantages
1	Highest sensitivity and specificity Visualization of small and deep LNs	High cost Radioactivity contrast
2	Liposoluble contrast Guide to perform radiotherapy treatments	Less sensitivity and specificity than lymphoscintigraphy
3	Not radioactivity contrast Easy to perform and low cost	Difficult to biopsy deep LNs Not representative samples
4	Easy, cheap and available	Lowest sensitivity used alone

Conclusions

- SLN biopsy should be an essential step of the staging process and a minimum invasive alternative to radical LAD.
- It is recommended the use of mapping techniques for the characterization of lymphatic drainage due to its variation associated with tumor processes.
- The most feasible and valid technique to be implemented is the indirect lymphography combined with methylene blue dye injection.
- Increased owner concern and percentage of tumoral processes make mapping and selective biopsy a good tool to be applied in the near future in veterinary practice.

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